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SUMMARY

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Canada

FOOD PRESERVATION BY LOW DOSE GAMMA IRRADIATION

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FOOD PRESERVATION BY LOW DOSE GAMMA IRRADIATION

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Summary

(a) Food preservation by gamma irradiation appears to have promise as a method of increasing food supplies in areas of the world where shortages exist and where climate and storage conditions contribute to excessive spoilage. It should also be valuable in extending shelf life of fresh products to permit marketing over a longer period and at greater distance from the production area.

(b) The Canadian program envisages three stages of accomplishment: initial scientific tests on small quantities, combined with observation of side effects; pilot plant tests at production or processing locations; and full scale processing on a commercial basis. Not all products under consideration will go through these stages at the same time.

(c) The objective of food preservation by gamma radiation is, of course, to conserve the quantity or quality of the product. This method of conservation must be related to other ways of accomplishing a similar result and to the economics of the process. The factors to be considered within the above general objective will vary widely from one country to another and between areas in the same country.

(d) Based on the work done in Canada and elsewhere, a number of agricultural products appear amenable to treatment with gamma radiation.

(i) Commercial sprout inhibition of potatoes, onions, carrots, and garlic appears promising. Dose requirements are low at about 8,000 rads.

(ii) The treatment of pork with doses of 20,000 to 30,000 rads removes the hazard of trichinosis. Technical feasibility has been established and commercial application may be imminent.

(iii) Doses of 20,000 to 50,000 rads will prevent reproduction of insects in stored cereal crops. Such treatment, combined with good storage conditions, should reduce the serious losses of food products which may occur, particularly in warm and tropical countries.

(iv) Early commercial application of radiation treatment of poultry and egg products is anticipated. Salmonella organisms in frozen eggs can be destroyed at dosages of 300,000 to 500,000 rads.

2. (a) The time allocated to this paper precludes detailed examination of the work done on all products. I have therefore chosen to examine a specific case, namely, inhibition of sprouting of fresh vegetables and particularly potatoes.

(b) In 1961 we designed and produced a Mobile Demonstration Irradiator. Massive tests of pilot plant quantities were performed in the fall of 1961 and again in 1962.

(c) The irradiator is mounted on a standard trailer 8' x 12' x 34' capable of highway transport. Details are as follows:

Shielding - 10" of lead in steel to contain 25,000 curies cobalt-60.

Weight - Machine 65,000 lbs.; trailer 15,000 lbs.; tractor 12,000 lbs.

Throughput at 15,000 curies - 2,500 lbs. per hr. at 7,500 rads.

(d) Buckets are received on a conveyor, pass through the irradiation chamber, and are discharged on a separate conveyor at the same end of the van. Eight bucket positions are provided within the irradiation chamber, four each on two ferris wheel mountings. Each bucket therefore makes two complete revolutions around the rod style source, remaining upright at all times.

3. (a) In August 1960 a submission was made to the Food and Drug Directorate recommending their approval of the sale of potatoes treated for sprout inhibition by cobalt-60 radiation up to a dosage of 10,000 rads. The submission was accepted in November 1960.

(b) Between October 1961 and March 1962 test irradiations were performed at 26 storage areas in Ontario, Nova Scotia, New Brunswick and Prince Edward Island. Tests were performed on Kennebec, Sebago, Katahdin, Netted Gem, Cherokee, and Irish Cobbler varieties with subsequent storage in box, bin, barrel, and bag. The conditions and time of storage prior to and after treatment varied widely. In 8 of the 26 locations the potatoes were stored at temperatures ranging up to 70°F for subsequent processing.

4. (a) Completely effective sprout inhibition was obtained in all cases. Radiation treatment was observed to be more effective than other methods. A lower dosage level would probably be satisfactory on a commercial basis. There was no internal sprouting and irradiated potatoes remained firmer than controls. Some dry rot was present in both control and treated potatoes. Irradiated potatoes were found to be more resistant to light greening. The quality of chips, instant mashed flakes, frozen french fries, and fresh boilers produced from irradiated potatoes was found to be good.

5. (a) The favourable results make commercialization of the process imminent. Low cost can only be obtained with volume throughput. We envisage a full scale irradiator suitable for Canadian conditions with a throughput of some 13,300 to 26,600 pounds per hour. This will require a cobalt-60 source of 60,000 to 120,000 curies. The machine would not be mobile and would be operated by semi-skilled technicians only.

6. (a) The simplicity of design and operation of anticipated full size irradiators should make them particularly attractive in areas where skilled personnel are scarce. The reduction of spoilage in food products will be important in areas of high population density and low per capita production.

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